

# THE FUTURE ARMY TACTICAL FIRE FIGHTING TRUCK

By Major Mollie Pearson and Mr. Michael Bonomolo

On 29 January 2005, the 406th Engineer Fire Fighting Detachment, 89th Regional Readiness Command, received the first M1142 Tactical Fire Fighting Truck (TFFT). This new fire truck replaces the 20-year-old Amertek, Incorporated, Military Adaptation of a Commercial Item (MACI) 2500L. The Army will purchase more than 100 of these new fire trucks over the next five years.

## History

On 5 April 1974, the Department of the Army (DA) approved a Required Operational Capability (ROC) document for a family of fire fighting equipment. The ROC stated that this new type of TFFT would have the capability to combat three types of fires: structural (military buildings, troop housing, and storage areas), brush, and aircraft crash/rescue (small and intermediate). The determined materiel solution was the MACI 2500L, fielded from the early to mid-1980s.

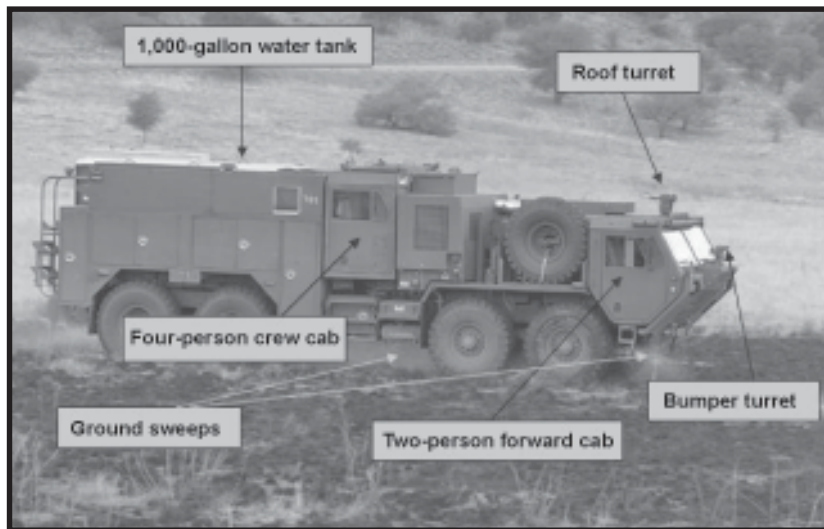
The MACI, a commercial fire fighting vehicle adapted for tactical use, had its share of mechanical problems. It was unreliable and difficult to repair. A major contributing factor for the poor maintenance and lengthy repair times was that as the last MACI was fielded, Amertek divested itself of its fire truck production line. As a result, repair parts became scarce and often required off-line manufacturing. Second, the MACI's ability to effectively carry out only three types of missions was considered a limiting factor for the Future Engineer Force (FEF), which is expanding the fire fighting tasks from three to

five. A third factor was the truck's lack of water capacity. According to Army Regulation 420-90, *Fire and Emergency Services*, an aircraft rescue fire fighting vehicle must carry a minimum of 1,000 gallons of water to support Army tactical airfield operations. Air Force fire test site results, using empirical calculations adapted from the Federal Aviation Administration (FAA),<sup>1</sup> determined that tactical airfields supporting 46 missions or more per day—or servicing CH-47 aircraft or larger—require fire trucks with a water capacity of at least 1,000 gallons. Unfortunately, the MACI's lower water capacity of 660 gallons requires that there be two trucks on-station when supporting airfield operations.

## Development

In 1995, having read feedback from field units, personnel from the US Army Engineer School determined that the aging and unreliable MACI should be replaced. Before development could begin, a user requirements document was needed to justify the expense of purchasing a new fire truck. The document articulated user requirements to the materiel developer, who translated approved user requirements into a fire truck blueprint releasable to industry. The Engineer School chose to express its user requirements via a Statement of Continuing Needs in 1996 and 1997; two documents were drafted and subsequently approved in late 1997. The materiel developer then deciphered the user requirements into engineering standards that industry would understand—a Request for Proposal (RFP). In 1999, the materiel developer released the RFP, soliciting the design solution from industry.

The TFFT contract was awarded to Pierce® Manufacturing, Incorporated, of Appleton, Wisconsin, in mid-2000. The mobility Battlefield Operating System of the Army's Program and Objective Memorandum allocated no funding for research and development. Therefore, it was decided to use known components to put the TFFT together, and an Army heavy expanded-mobility tactical truck (HEMTT) was mated to a commercial fire fighting package. The project manager consulted subject matter experts (Army firefighters) from the US Army Training and Doctrine Command and the US Army Reserve about parts required, as well as field demands emplaced on a TFFT, to ensure the best design possible.



Passenger-side view of the M1142 Tactical Fire Fighting Truck



**M1142 Tactical Fire Fighting Truck versus the Military Adaptation of a Commercial Item 2500L**

It was decided early in the process that commercial fire fighting standards according to the National Fire Protection Association (NFPA) would be used as a guide, and strict adherence would not drive the development of the TFFT. There were many reasons for this. The TFFT is a multifunctional fire fighting truck envisioned to combat five types of fires/hazards encountered by firefighters in the field: wildland; structural (limited to two stories or less); petroleum, oil, and lubricants (POL) and hazardous materials (HAZMAT); tactical vehicle; and aircraft crashes. Designing the fire truck to meet all five missions to NFPA standards would significantly increase cost, require a larger vehicle, and increase engineering and development time.

### **Design Challenges**

**T**he TFFT user requirements challenged Pierce to come up with a unique design. Among the many technical challenges to overcome, the following were the most noteworthy:

**Expanding the HEMTT crew-carrying capacity from two to six.** Pierce placed an air-conditioned four-man crew cab just to the rear of the HEMTT engine. Communication between the driver's compartment and the crew cab is accomplished via a vehicular intercom system.

**Providing the pump operator with an unimpeded 360-degree view of a fire or crash scene.** The pump panel was placed forward of the four-man crew cab on top, facing toward the front of the vehicle. Access to the pump panel is through the crew cab's removable roof, and a recessed shelf provides a place for the operator to stand.

**Sustaining uninterrupted water pressure to the outlets and water cannons for pump-and-roll capability, as the vehicle altered its speed.** Coupling the 1,000-gallons-per-minute water pump to the transmission-driven power takeoff meant that less energy was received by the pump, which lowered the water pressure to the water cannons as the HEMTT slowed. Aircraft crash rescue techniques, or pump-and-roll, require the fire truck to maintain continuous water pressure to overcome the intensity of a fuel fire. Pierce surmounted this deficiency by adding a second engine, a 200-horsepower Deutz® pump engine, to exclusively power the water pump. It was located forward of the four-man crew cab just below the pump panel. The second engine can be started at any time and is not affected by the speed of the truck, assuring nonstop power to the water pump. There are maintenance access panels

on both sides and an inherent exhaust pipe, though fuel is drawn from the HEMTT's fuel tank.

**Maintaining command and control among the TFFT crew, both for fire fighting and day-to-day operations.** The TFFT was provided with a set of four frequency-modulated (FM) handheld radios and one cab-mounted, very high-frequency (VHF) base radio. This allows the on-site fire chief to communicate with his team at a fire or crash site. Communicating between the two cabs is accomplished via a Fire Com 3020R intercom set. Additionally, a Single-Channel Ground-to-Air Radio System (SINCGARS) provides command and control with the maneuver commander's forces.

**Overcoming the front cab's narrow steps to accommodate the width of the firefighter's boot.** The ability to modify the HEMTT chassis was limited by regulations. A human factors engineering modification was submitted by the Army Research Laboratory and is being evaluated as a general fix for all HEMTTs.

**Overcoming the lack of comprehensive basic issue items/components of end items fire fighting equipment currently on the fire team's table of organization and equipment.** The project manager purchased commercial-quality fire fighting equipment and made it part of the technical data package that is required to support the TFFT.

**Storing the additional equipment procured for the TFFT in the limited storage areas.** Pierce designed storage areas on both sides of the TFFT.

### **Operational Test**

**T**he TFFT was subjected to an operational test at Fort Huachuca, Arizona, from July to August 2003. An overall summary of the test reached this conclusion:

*"Soldiers from four different Regional Readiness Commands from across the United States successfully used the TFFT to conduct all firefighting missions prescribed in the TFFT operational mode summary/mission profile (OMS/MP) during the Initial Operational Test. Missions consisted of structural fires, aircraft crash rescue fires, vehicle-HAZMAT fires, vehicle rescues, and wildland fires. Computer-controlled, propane-fed simulators were used to simulate the structural and aircraft crash fire missions. Both crews conducted each mission successfully during daylight and hours of darkness. Salvage vehicles were used to conduct the vehicle rescue and vehicle-HAZMAT missions. Both*



**Left, side view of current TFFT step; right, a view of the proposed larger step to accommodate the firefighter's boot.**

*firefighting teams successfully executed these missions during daylight and hours of darkness. A 5-acre wildland fire was ignited in the local training area and successfully contained and extinguished by the two firefighting teams working in tandem. The TFFT proved to be highly mobile throughout the test and provided the soldiers with ready access to all equipment necessary to execute each mission. The soldiers were unanimous in their opinion that the TFFT is far superior to systems currently assigned to their units.”<sup>2</sup>*

### **The Future**

**F**ielding of the TFFT to the engineer fire fighting teams—all components—and to Ordnance Ammunition Company fire fighting teams will be completed in fiscal year 2007. Revisions to the DA-approved distribution schedule are being staffed at this time, with the revisions necessitated by the ongoing deployments and redeployments of engineer fire fighting teams.



**Members of the 89th Regional Readiness Command with the Army's newest fire truck.**

The Project Manager (PM), Heavy Tactical Vehicles (HTV), is committed to providing soldiers the best possible equipment, consistent with the requirements of the Engineer School. As this system is fielded, the PM HTV will welcome comments from the field concerning product improvements or modifications for inclusion in future production or for consideration as field retrofits. Information on this feedback system will be provided to soldiers of gaining units during new materiel introductory briefings.

The Engineer School; the PM HTV; and industry partner, Pierce Manufacturing, Incorporated, have worked together over the last seven years to develop, build, test, and procure a fire fighting vehicle to meet the multiple, varied missions required of an engineer firefighter. With our combined teamwork, we have produced a TFFT unmatched in its abilities to support the Current and Future Engineer Force.



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### **Endnotes**

<sup>1</sup> FAA Advisory Circular 150/5210-6C and the NFPA formula, Appendix A, National Fire Protective Association 418, pp. 418-9.

<sup>2</sup> Test Report for the TFFT IOT, test #2003-OT-E/CS-1960, HQ, US Army Operational Test Command (OTC), 19 September 2003.